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Meadow and Creeping Foxtail Seed Production in Alberta

This publication is a general guide for the production of meadow and creeping foxtail seed. Local conditions and your experience as a producer should be kept in mind when following these guidelines.

Introduction

Although foxtails are mentioned in agriculture texts dating back to 1923, they are still viewed as new grasses in Alberta and at times they are confused with foxtail barley and/or green foxtail, which are serious weeds. Meadow and creeping foxtail are long lived perennial grasses that have very early spring growth and excellent regrowth ability. The foxtails usually begin spring growth earlier than brome grass and timothy. Both meadow and creeping foxtail have excellent flooding tolerance similar to that of reed canary grass. The foxtails do best in cool, moist areas of Alberta. The seed head superficially resembles timothy but has a silky smooth surface and the seeds are chaffy.

Meadow Foxtail is characterized by a beige-tan seed color and has a bunch or tufted type growth habit, with very short and non aggressive rhizomes. It is of medium height with the majority of its leaves in the bottom 12-20 inches. Total plant height is usually 2½-4 ft.

Creeping Foxtail is characterized by a black seed and is strongly creeping rooted. It is taller growing than meadow foxtail and stands over five feet in height have been grown.

Seed production of both meadow and creeping foxtail is limited in Alberta. The reason is that although the crop is easy to grow, serious harvesting and seed cleaning problems do exist. Seed yields are low.

Seed and Seed Yield

Foxtail seed is a relatively small but fluffy seed due to the attached awns. Meadow foxtail contains approximately 580,000 seeds per pound and creeping has approximately 750,000 seeds per pound. Because of the awns, the seed is very difficult to plant, combine, dry and clean. The average bushel weight of this seed is less than 15 lb/bushel.

Several seed companies provide coated foxtail seed (either a clay or phosphate coating) that eliminates the difficulty of seeding light fluffy seed and assures even distribution. The coated seed contains approximately 25 per cent seed by weight, so seeding rates must be adjusted.

Climate and a lack of producer experience are limiting seed yields. Average foxtail yields for beginning growers are approximately 30-50 lb/acre of clean seed. American data shows a seed yield range of 100-400 lb/acre, but unfavorable weather conditions at harvest time can cause wide variability in yield. Seed yield from hand stripped samples taken in the Westlock area, north of Edmonton, approached 300 lb/acre before actual harvesting occurred.

Only one variety of meadow foxtail is registered for use in Canada. There are no creeping foxtail varieties registered in Canada. Before purchasing seed, check the availability and yield potential of the variety and its growth characteristics and marketability. Ask for a seed certificate from the supplier and pay close attention to the kind and number of weed seeds.

Pedigreed Seed Production

With the recent registration of a Canadian variety, pedigreed seed production will be possible when sufficient supplies of seed become available. For information on pedigreed seed regulations, check the Canadian Seed Grower's Association publication circular 6.

Choice of Land

Meadow and creeping foxtail seed production is suited to the cool, moist areas of the province. Peaty and muskeg soils, potholes, sloughs, old lake bottoms, flood plains with a high water table, and upland sites receiving ample moisture in early spring to the end of June are the ideal locations for foxtail seedings. Any drought periods during the growing season will reduce or prevent seed production. Foxtail grasses tolerate both acid and alkaline conditions and do well within a pH range of 5.1 to 8.4.

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The salt tolerance of foxtails is moderate at 14 millimhos/cm. Early spring growth is more affected by air temperature than soil temperature. Rapid growth can occur when the air temperature reaches 10° C even if the soil temperature remains near freezing.

Land that was previously treated with atrazine, Banvel, Glean, Ally, Lontrel, Princep, Rival, Treflan, Triflurex, Heritage, Fortress, Sinbar and Tordon 202C have forage cropping restrictions. Before seeding meadow or creeping foxtail, check the *Guide to Crop Protection in Alberta, Part I - Chemical*, Alberta Agriculture Agdex 606-1; and *Weed Control in Forage Crops*, Alberta Agriculture Agdex 120/640-1 or the herbicide label for wait periods.

Clean land should be used for establishment of foxtail stands. Perennial weeds and other grasses including native sedges should be controlled before seeding.

Field Sanitation

In light of the difficulty to clean foxtail seed, choose a relatively weed free field, especially one that is free of perennial weeds and grasses including native grasses and plants.

Because of the long term nature of foxtail stands and the general peaty soil or muskeg location, the following weed seeds have been found in seed samples and are potentially problem weeds; cinquefoil, Canada thistle, perennial sow thistle, dandelion, avens, hawks-beard, and water foxtail.

New regulations in the Seeds Act have lowered the allowable maximum number of certain weeds. Good field sanitation before seeding will ensure that high seed purity standards will be met.

Stand Establishment

Seed bed preparation

Seed into a firm, moist seed bed and at a shallow seeding depth of approximately ¼ to ½ inch. On peaty soils and muskeg areas, compaction and shallow seeding are essential, although difficult to achieve.

For peat soils and adjacent gleysolic areas, heavy packing is required both before and after seeding. Land rollers with water ballast and a press drill or Brillion seeder work well to achieve the correct seeding depth. If the peat is loose, both a press drill and the Brillion seeder tend to push peat soil ahead and plug up. Good compaction can be achieved by dragging heavy floats or beams over the field to level and pack the soil before seeding. After seeding, a land roller or coil packers will complete the packing.

With high organic matter soils the best compaction occurs when the fields are moist. Inadequate compaction usually happens in dried-out (over-worked) fields.

Seeding Date

Seed as early as possible into a moist seed bed. Local experience has shown that the foxtails can be seeded until late July if soil moisture conditions are excellent and the weather is cool.

In low lying areas that remain wet until late in summer, seeding must be delayed until the soil is firm enough to support equipment. Seeding should be completed early enough to obtain 6 to 8 weeks of seedling growth and to get the stand well established before winter. If this is not possible, late fall seedings (mid-late October) that preclude germination until the next spring are also successful in wet areas.

Row Spacing - The common methods of seeding is to either dribble the seeds onto a well packed soil and follow with a light packing or drill the seeds into a firm seedbed in either 6 or 7 inch spacings. Research into planting density suggests that wide row spacings and low plant density in moist areas usually results in serious weed infestations. Higher plant densities and vigorous growth minimize weeds and produce more seed heads.

Seeding Rate

The recommended seeding rates are 3 lb/acre for direct seeding and 5 lb/acre if a companion crop is used.

If coated seed is used, the seeding rates should be increased because coated seed contains only 25 per cent seed by weight. With its better seed flow and distribution, it is not necessary to use four times as much coated seed to get the same stand establishment. Approximately 8 to 12 lb/acre of coated seed is sufficient.

Under adverse seeding conditions, higher seeding rates can be used but a better stand will be obtained if the soil or establishment problem is solved rather than relying on using more seed.

Companion Crops

Because seeding is done mainly on poorly drained and low compaction soils, companion crops are not recommended. Companion crops seeded under very moist conditions often lodge and are difficult to harvest at the correct time. If a companion crop must be used, choose early maturing varieties. Ensiling the companion crop at the end of July is preferred over harvesting it for grain.

Fertilization

Establishment Year

Test the soil in the fall or before seeding in the spring. Follow the soil test recommendations. Peaty soils are usually low in nutrients. A fertilizer blend incorporated just before seeding is usually required

to supply sufficient amounts of nitrogen, phosphorus, potassium and sulphur for proper establishment.

Production Years

Both meadow and creeping foxtail respond well to high annual rates of nitrogen (N) for forage production. However, these high rates (up to 100 lb actual N/acre) will cause severe lodging of a seed crop, especially with meadow foxtail. Creeping foxtail is more resistant to lodging but will lodge under high N and high moisture conditions. Lodging will decrease or prevent the chance for a good seed harvest. In the Westlock area, the maximum recommended nitrogen rate for foxtail seed production is 50 lb N/acre/year. A rate of 100-150 lb/acre of 34-0-0 is common in this area.

Because of the very early spring growth habit of both meadow and creeping foxtail, nitrogen fertilization should be done in late fall. Early spring application is difficult to accomplish before spring growth occurs.

For established stands requiring additional phosphorous, potassium or sulphur, it is best to broadcast the fertilizer after seed harvest and aftermath removal.

Weed Control

Since weeds can reduce the yield and quality of foxtail seed, create harvesting problems and add significantly to seed cleaning costs, steps should be taken to control weeds in meadow and creeping foxtail.

The use of seed that is free of troublesome weed seeds is an important first step. Check the seed testing certificate for weed seed content. Seeding on clean land is an extremely important second step. Since chemical weed control measures are limited in foxtail crops, weedy land should be cleaned up before seeding. This is particularly true when problem perennial weeds such as Canada thistle, perennial sow-thistle, toadflax and quack grass are present. Tillage and/or a herbicide, such as Roundup, can be used to control these weeds before seeding. Use agronomic practices that contribute to the quick establishment and maintenance of a vigorous, highly competitive crop stand to reduce weed growth.

In foxtail stands seeded without a companion crop, mowing at a height just above the seedling grass will control many annual weeds during the year of establishment. A flail-type mower that distributes the plant material evenly over the field is preferable to a swather. If a swather is used, the canvases should be removed so that a windrow is not formed to smother the grass seedlings. Mowing can also be used to control weeds in one-year-old stands that have not developed sufficiently to produce an adequate seed crop.

Meadow and creeping foxtail, once established, are fairly competitive with most weeds. They also have the advantage of early maturity, so that the seed can be harvested before the weeds produce mature seed. Where perennial weeds are a problem in an established stand of meadow or creeping foxtail, hand roguing smaller numbers and either mowing or spot spraying patches with a herbicide, like Roundup, can be used. Spot spraying will suppress or kill foxtail as well.

MCPA and 2,4-D are the only herbicides registered for use in meadow and creeping foxtail. The rate used should not exceed 0.45 L/acre (500 g/L formulation). In the year of seeding, applications should be made when the foxtail seedlings are in the 2-4 leaf stage. In established meadow and creeping foxtail, 2,4-D or MCPA may be applied before the shot blade stage or in the fall after the seed crop has been removed. They should not be applied during flower development or pollination because seed yield will be reduced.

Do not use herbicides that are not registered for use on meadow or creeping foxtail since they can cause extensive injury to the foxtails, including underseeded foxtail. Poast, Fusilade, Hoe-Grass, Mataven, Glean and Ally have caused injury to meadow or creeping foxtail in research trials. The soil incorporated herbicides, Avadex BW, Edge, Fortress, Treflan, Rival and Triflurex can also seriously injure the foxtails.

Insect Control

Silvertop of Foxtail

Plant bugs cause **silvertop** in meadow and creeping foxtail. The condition is characterized by a bleached and dead seed head and stem above the last node but a healthy flag leaf, sheath and lower stem. These symptoms appear soon after head emergence, usually before the seed head has fully expanded. The lower end of the stem is usually shrunken, darkened and necrotic and can be pulled out of the flag leaf sheath.

Adult plant bugs are small, 4 to 9 mm long, winged insects that range in color from pale green to greenish brown to black. Some species are oval in shape, others are long and slender. Their wings are folded flat on their backs, the upper part of their forewings being somewhat leathery and the lower part membranous. The nymphs pass through five instars before becoming adults. The first instar is very small while the fifth instar is about the size of the adult. Nymphs can be distinguished from the adults by the lack of wings on the nymphs. The older nymphs have small wing pads, which eventually form

into wings. The specific species responsible for causing silvertop of foxtail in Alberta is unknown at the present time.

Damage is caused by plant bugs feeding on the plant stem through the leaf sheath before heading occurs. The plant bugs have sucking-piercing mouthparts, which they use to withdraw plant sap from the grass stem. The result of feeding is a shrivelled and constricted stem and the death of the stem and seed head above the feeding point.

Some of the plant bug species overwinter as adults and lay eggs in the spring. Other species overwinter as eggs in the grass stubble and the nymphs hatch in the spring. Some species have one generation during the growing season, others have two.

At present there are no recommendations for controlling the plant bugs that cause silvertop.

Harvesting

This is the most important step of growing foxtail for seed and the most difficult. Foxtail stands tend to head and mature unevenly, and mature heads shatter easily. Maturity and shattering occur from the tip of the head downwards. Seed maturity is controlled primarily by temperature and moisture and not by day length as is the case with some other grass species.

Time of Harvesting

Meadow and Creeping foxtail are usually ready to harvest in the first two weeks of July in north central Alberta. Three criteria can be used to judge when harvest should begin. These include the number of heads beginning to show tip shattering, the color of the field and heads and the color of the three-to four-inch-length of stem just below the head.

Meadow Foxtail is ready to harvest when the field is beige to tan in color, at least three-quarters of the heads are mature, less than one-half of the seed heads show tip shattering and the stems below the mature seed heads have turned from green to tan.

Creeping Foxtail is ready to harvest when the field is black in color, at least three-quarters of the heads are mature, less than one-half of the heads show tip shattering and the stems below the mature seed heads have turned from green to a golden yellow.

Fields should be monitored constantly because maturity changes can occur within one to three days if temperatures are high. Heavy rains, wind or hail will easily shatter off most of the seed if the field is nearly ripe enough to harvest.

Harvesting

Two general methods of harvesting have been successful. Traditional swathing and combining has been normally used, but recently the development of a specialized harvester for straight combining has also been successful.

Swath and Conventional Combine - At the correct stage of maturity, the field is swathed above most of the green leaf matter, providing a high stubble for quicker drying. After the windrows are completely dry, combining can begin. The combine will easily plug if the swaths are not dry. No combining can be done when a morning dew or light rain occurs.

Combining settings vary, but the following steps have been successful in the United States.

a. Slow the ground speed to avoid overloading the straw walkers and the sieves. Foxtail needs about 30 per cent more separating time than other small-seeded grasses.
b. Shut off air by sealing the fan housing or by inactivating the fan.
c. Remove the screens that follow the sieves.
d. Adjust concave spacing to one-quarter inch.
e. Adjust cylinder speed to 3,500 ft/min: ft/min = r/min x cylinder diameter in feet x 3.14.

For example:
a 15-inch (1.25-ft) diameter cylinder at 900 r/min = 3,500 ft/min, or 900 x 1.25 x 3.14.

Threshed seed is trashy; seed purity seldom exceeds 20 to 25 per cent. The material is difficult to handle with auger-type conveyance equipment. Seed can be moved from the combine to storage and processing areas with less difficulty by bucket, belt or pneumatic conveyors or in sacks. Once the seed is processed, however, it can be moved easily by any conveyance.

Always check seed moisture. If the seed moisture content is above 10 per cent, the material should be spread on a wooden bin floor and manually turned several times a day until it is dry.

Wet foxtail will mildew quickly. Some producers use an aeration bin to dry the seed. Fans blow air through the spread material until it is dry.

Straight Combining

A specialty seed harvester, Vertec 2250, has been developed in Alberta to strip seeds from foxtail heads without cutting the plant. This process produces a much cleaner sample than conventional combining because no straw pieces or leaves enter the seed tank. Since the plant is still growing, the seed has a much higher moisture content when stripped (up to 40% moisture content) and seed drying is necessary to prevent mildew and reduced seed germination. It is essential to manually turn the material on a wooden floor or to use aeration bins.

The main risk with a straight harvest system is that of higher shattering losses caused by allowing the field to become mature for successful harvesting.

Seed Processing

Whether obtained by the conventional swath and combine system or by the new straight stripping technique, all foxtail seed requires some additional seed processing to remove the awns from the seed and to remove the chaff, stems and leaves. After this is accomplished, the weed seeds and remaining inert material can be removed with an air-screen separator.

The awns can be removed by a debearder or by using a hammer mill or grain auger flighting. Several passes may be necessary.

After the awns are removed, the individual seeds are smaller in effective size and exhibit a higher specific gravity.

Approximate screen sizes on a four-screen machine are:

	In.
Top scalper	8/64 round
Top finsher	1/17 round
Bottom scalper	7/64 round
Bottom finisher	1/18 round

Shaker speeds of 350-400 rpm are used. Maximum pitch on all screens is necessary to ensure good seed flow. The fan can be adjusted to remove the fine material without seed loss. A specific gravity separator can make fine separations possible.

This seed cleaning process including the debearding process is not readily available. Confirm that cleaning facilities are available before growing foxtail for a seed crop.

Aftermath Removal

With the early maturity of seed heads, foxtail aftermath is very green at harvest time. The baled aftermath will provide an acceptable maintenance feed for cattle. Crude protein levels range from 7 to 9 per cent for this aftermath material.

Because aftermath removal occurs in July, there is sufficient time for good regrowth of the foxtail stand for use as a late fall pasture if sufficient nitrogen and moisture are available. This practice will not reduce seed yields in the following year.

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